

# PROTERRA LLC

## FAST CHARGE BATTERY ELECTRIC TRANSIT BUSES

### ECONOMICALLY AND ENVIRONMENTALLY SUSTAINABLE

### SIMPLE AND SAFE ADVANCED TECHNOLOGY

*Proterra EcoRide hybrid / Battery-electric  
Transit Bus*



*Proterra Hybrid and Battery-electric  
ProDrive™ System*



*Proterra Rapid Charge Station with  
Terravolt™ Energy Storage*



**Confidential**

*ARB ZEB Workshop*

2009-05-

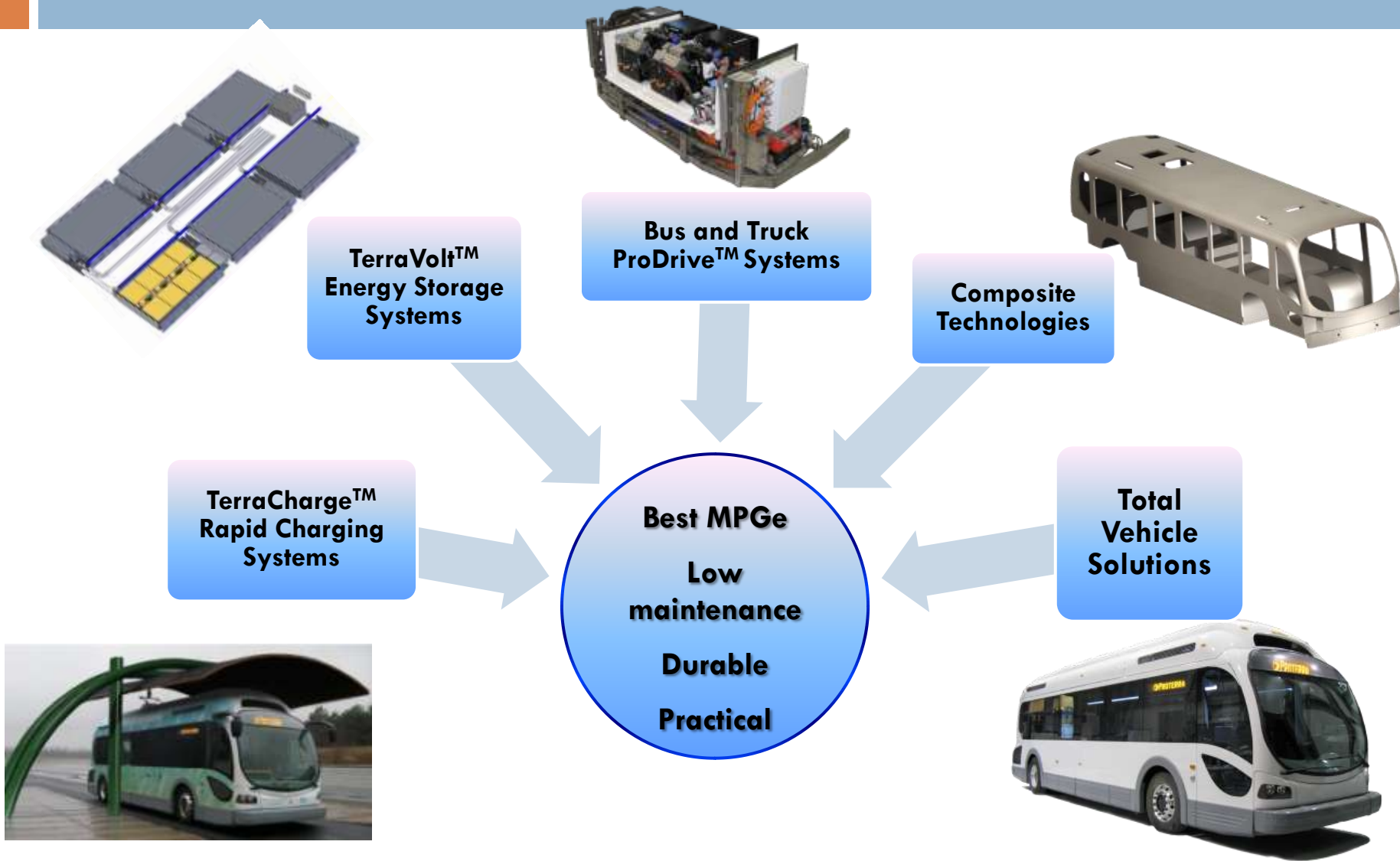
*Joshua Goldman - Proterra LLC*

16360 Table Mountain Parkway, Golden, CO 80403

JGoldman@ProterraOnline.com (303) 562-0529

# Proterra's Products

2



# TerraVolt™ Energy Storage System

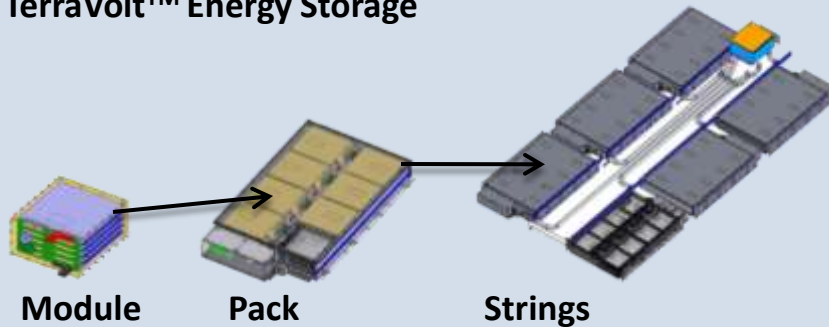
3

## Core System Components

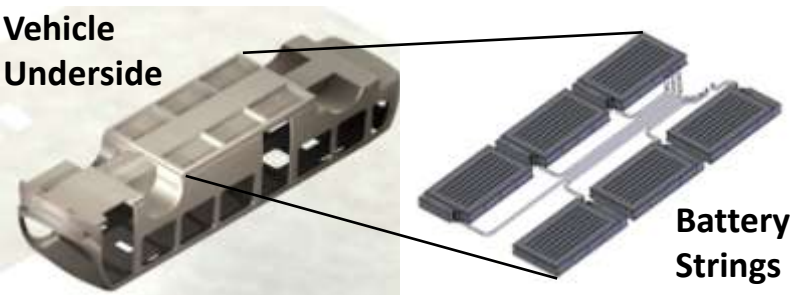


Battery Management System

### TerraVolt™ Energy Storage



Vehicle  
Underside



## Customer Benefits

- Industry's only system that can be fully charged in less than 10 minutes
- Ultra safe system design
  - Puncture and heat resistant
  - Sophisticated battery management system operates at the 'cell' level
- Energy storage system outlasts the vehicle or longer
- Scales in size and energy capacity to suit vehicle type and duty cycle needs

# TerraCharge™ Rapid Charging Stations

4

## Core System Components

**Retractable Catenarie Arm**



**Computer controlled  
vehicle charging receiver**

## Customer Benefits

- Makes it possible to deploy all-electric commercial vehicles in fixed-route applications today
- Small footprint enables customers to place in 'opportunity charging locations' along existing vehicle routes
- Uses existing power sources to rapidly deliver significant amounts of energy to charge heavy duty vehicles
- Makes it possible to reduce the amount of on-board energy storage and associated costs

# Proterra Composite Technologies

5

## Accomplishments

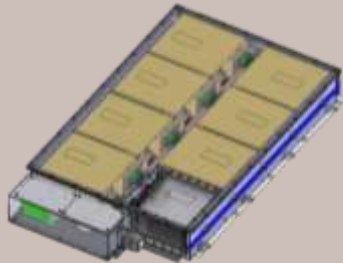


## Customer Benefits

- Purpose built designs that achieve maximum performance improvements
- 20-40% weight reduction; up to 10,000 lbs lighter
- 40%+ longer life; not affected by weather, salt or other chemicals
- Easier and significantly less costly to maintain than conventional metal bodies
- Improved safety with crash resistant composite structure

# Scalable Across Vehicle Types With A Few Modifications To Suit Range And Duty Cycle:

6



## **TerraVolt™ HDES**

kWh of onboard energy

- Range between charges
- Available fueling infrastructure



## **Electric Drive Motor**

One to two motors depending on

- Top speed
- Total load








## **Vehicle Control Systems**

Modifications as needed to accommodate specific route and duty needs.

# Management – Seasoned Team

*Proterra's team combines proven and innovative talent from several companies:*

	Prior Position	Strengths
<b>Jeff Granato</b> CEO & President	Sr. Manager at <b>McKinsey &amp; Co.</b> , Global Growth Strategy Practice.	Seasoned CEO & CFO, managing, organizing and leading business growth for over 20 years.
<b>Dale Hill</b> Founder, CTO, Chairman	Founder <b>TransTeq</b>  <b>Eco Mark IV</b>	Developed the most successful fleet of CNG hybrid buses in the world, which carried 150 million passengers to date.
<b>Ron Fardell</b> VP Operations	Director of Manufacturing <b>Textron</b>  <b>Textron</b>	20 years experience in operations, advanced manufacturing, engineering and Lean Sigma. Deep experience in vehicle and vehicle system manufacturing and product development.
<b>Ben van der Linden</b> Director - Product Prototyping	Director of R&D <b>NABI Bus</b>  <b>NABI CompoBus</b>	Considerable global bus industry, R&D, manufacturing experience, and launched the world's first composite body bus.
<b>Stephen Misencik</b> Director – Composites Tech.	VP Product Dev. <b>Martin Marietta Composites</b>  <b>MMC Composites</b>	Technology transfer of high strength marine composites to the bus industry, and has over 25 years experience in composite engineering design and manufacturing setup.
<b>Joshua Goldman</b> Director - Business Development	Director <b>Hybrid Systems ISE</b>  <b>ISE Hybrid Sys.</b>	Led the development of hybrid drive systems for ISE, co-chairs several standards boards and is widely considered an industry expert in hybrid drive systems.
<b>Reuben Sarkar</b> Director - Marketing	Lead Engineer <b>Chevy Volt, GM</b>  <b>Chevy Volt</b>	Lead engineer on game changing electric powertrain for the Chevy Volt electric vehicle; directed the daily activities of all electric drive unit product development teams.

# Proterra has begun to implement it's plan to meet industry demand for cost effective zero emission buses

- Body manufacturing capable of meeting demand is in place
- Hired expert firm to lead a competitive bid process across 20 states to establish Proterra's assembly plants
- Hired industry leading manufacturing and engineering management expertise in scalable and efficient manufacturing operations
- In Q3 2010 Proterra's scalable assembly plant comes on line: 18 month ramp to a maximum capacity of 500 vehicle annually
- In Q1 2012 the second scalable assembly plant comes on line
- Cumulative vehicles produced through Q4 2012 is projected at 975 vehicles as driven by demand



# Slideshow:

## *Proterra EcoRide hybrid / Battery-electric Transit Bus*

9



# Slideshow:

## *EcoRide BE35 Interior Seating    Driver's Station*

10



*37 Seated and 31 Standing passenger capacity*



*Significant advances in GPS driven control systems; very user friendly and energy efficient*

# Slideshow:

## *So easy to drive, anyone can learn*

11



# Slideshow:

## *Proterra EcoRide In Service In San Jose, CA*

12



# Slideshow:

## *Proterra FastCharge Station*

13



**Technology that will revolutionize urban transit**

# Foothill Program Announcement

- Unanimous Board Approval 4/24/2009
- Electrify one Foothill Transit Service Line (291)
- Use Proterra's Unique Rooftop Fast Charging System
- Use Proterra's Battery Electric 35' Composite Bus
- Initial order for 3 buses + 2 charging stations @ ~5.6M
- Fast Track Program with initial demonstration targeting Q1 2009
- Vehicle may apply for Foothill CARB ZEV
- Initially Achieve 80% Overall System (Vehicle + Charger) availability

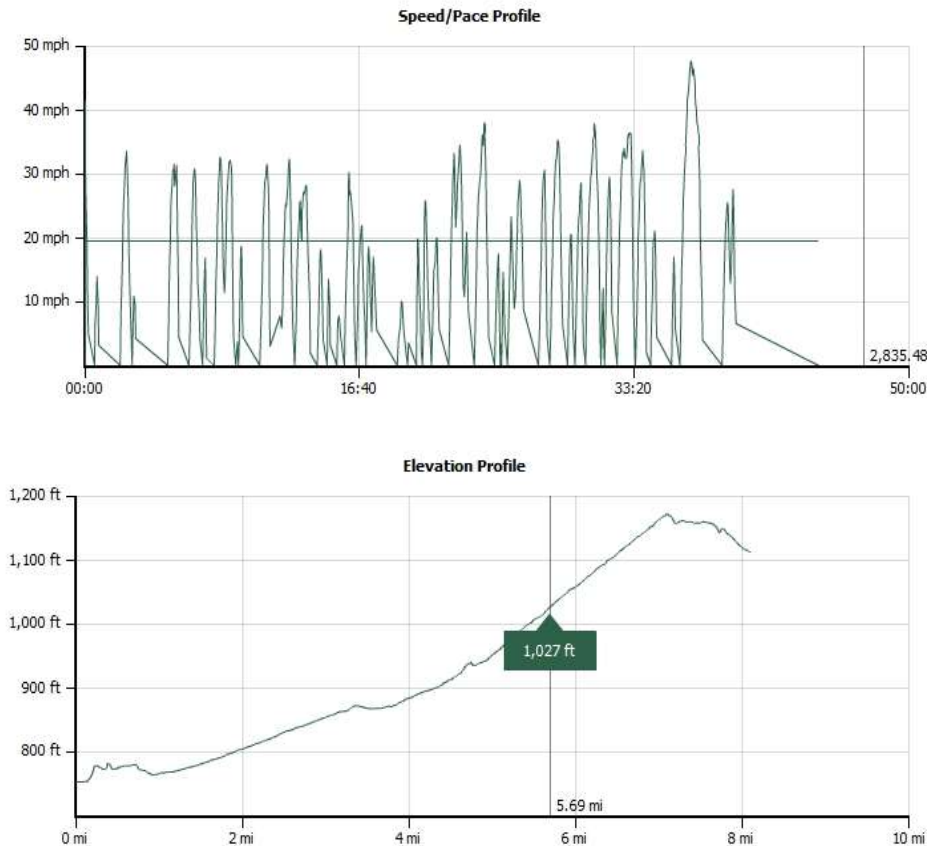
# Intended Route To Service



## Estimated Route Data (from Foothill):

- Weekday:
  - 9 Active Buses
  - ~120 mi per bus per day
  - 12.46 mph avg speed
  - 12.8 hrs revenue service per day
  - 0.8 hrs layover time per day
- Weekend
  - 5 Active Buses
  - ~85 mi per bus per day
  - 12.5 mph avg speed
  - 9.78 hrs revenue service per day
  - 0.86 hrs layover time per day

# Additional Route Data



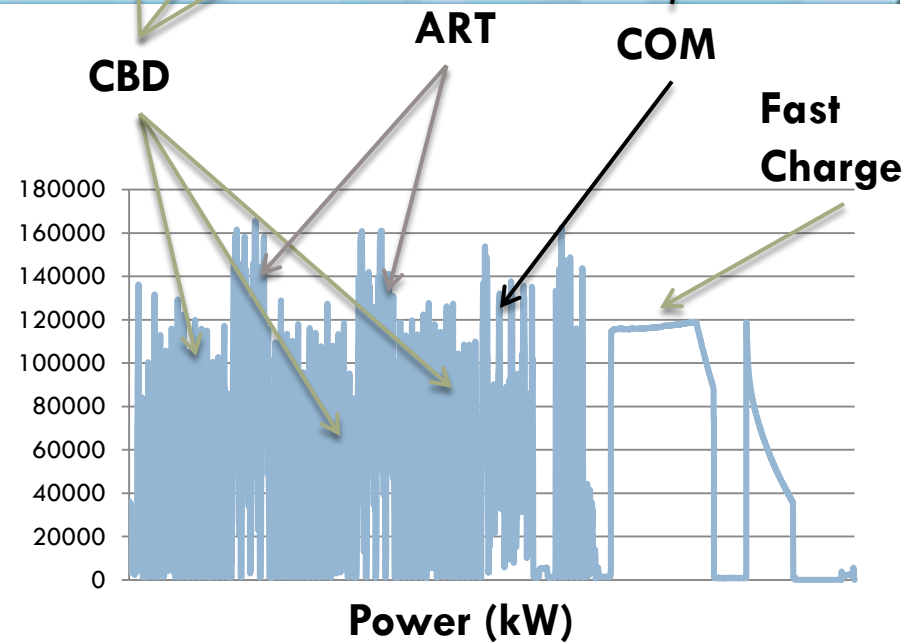
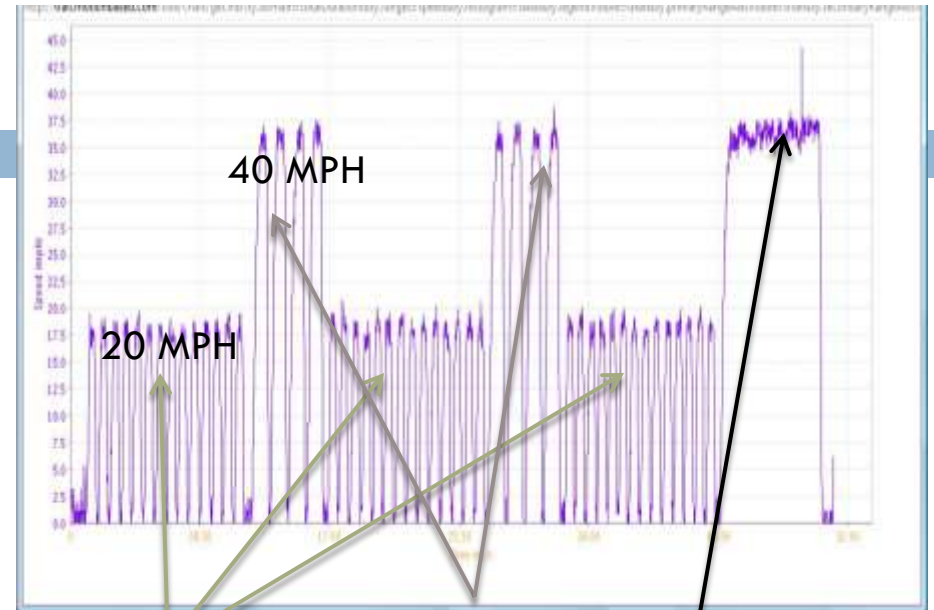
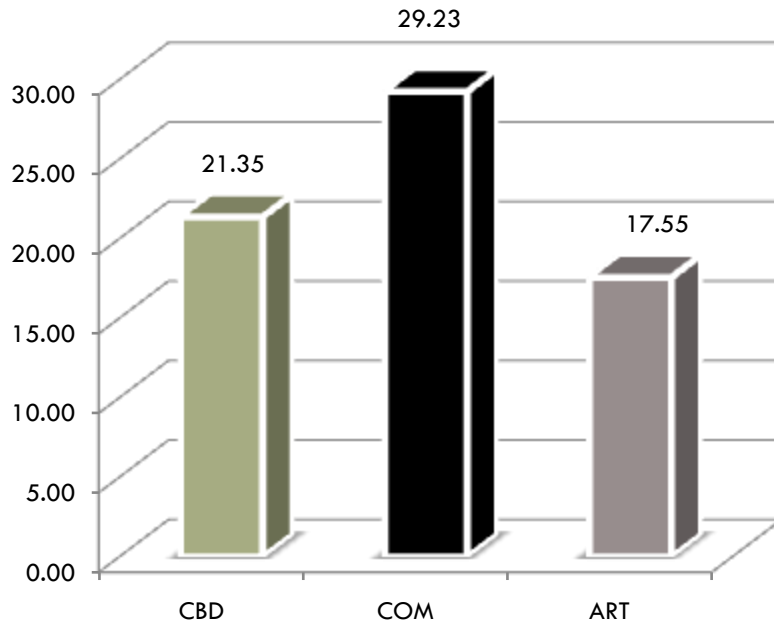
Data Sample Collected from 291 North Bound Route 2009-02-03 10 to 11 Am (Proterra)

- Avg overall speed of 10.25 mph (including layover)
- Moving Average: 19.6 mph
- 8.2 miles each way, 16.4 miles round trip
- Approximate 10 minute layover every 40-50 minutes
- First Trip starts 5:00 AM
- Last Trip ends 10 PM
- Typical Bus does 7 full trips on weekday, 5 full trips on weekends
- Short (<3 mile) deadhead



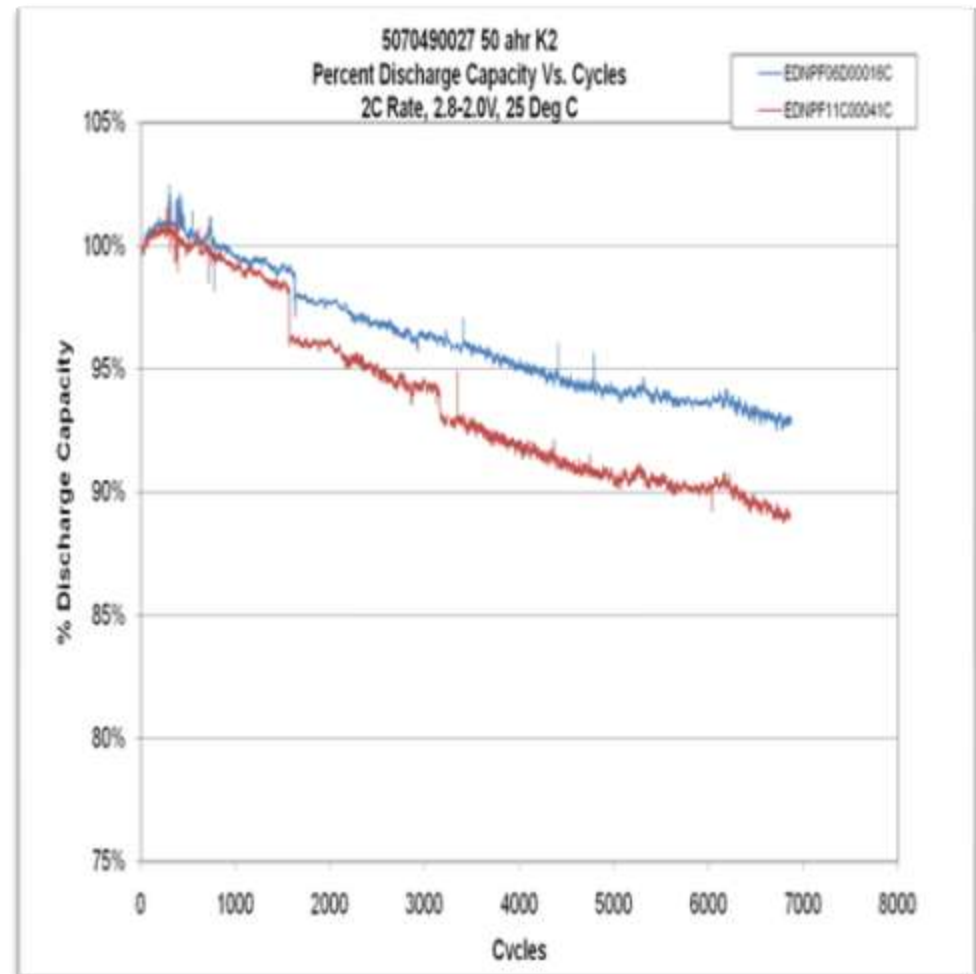
# Altoona Data

**FCBE35 MPG  
(diesel equivalent)**



# Advanced TerraVolt Energy Storage Testing

- Build upon cell and module level testing and full vehicle system testing to add confidence to our lifetime and durability of the ESS as applied to the Foothill proposed drive cycle
- Have partnerships with NREL and FTA (Penn State University) as well as UC-Davis for various portions of the complete ESS testing
- Once complete we can then address long term warranty of the complete ESS



# Questions?

Joshua Goldman

Director of Business Development

Proterra LLC

303-562-0529

[jgoldman@proterraonline.com](mailto:jgoldman@proterraonline.com)

[www.proterraonline.com](http://www.proterraonline.com)

*This Presentation may contain certain forward-looking statements that may relate to future events or future performance and reflect management's expectations regarding the Proterra LLC's growth, results of operations, performance and business prospects and opportunities. Such forward-looking statements reflect management's current beliefs and are based on information currently available to management. Although the forward-looking statements are based upon what management believes to be reasonable assumptions, Proterra LLC cannot assure readers that actual results will be consistent with these forward-looking statements. The Proterra assumes no obligation to update or revise any forward-looking statement to reflect new events or circumstances. Actual results may differ materially from any forward-looking statement. Historical results and trends should not be taken as indicative of future operations*